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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/717,246	11/18/2003	Edward William Adams	130924.62121	7752

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EXAMINER
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TSOY, ELENA

ART UNIT	PAPER NUMBER
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1762

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	01/17/2007	PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

## Office Action Summary

Application No.

10/717,246

Applicant(s)

ADAMS ET AL.

Examiner

Elena Tsoy

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 30 November 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-16 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-16 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

***Response to Amendment***

Amendment filed on November 30, 2006 has been entered. Claims 1-16 are pending in the application.

***Claim Rejections - 35 USC § 112***

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Rejection of claims 1-16 under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement has been withdrawn due to amendment.

***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Rejection of claims 1-16 under 35 U.S.C. 103(a) as being unpatentable over Bawendi et al (US 6,319,426) in view of Kohn et al (WO 99/24490) has been withdrawn under 35 U.S.C. 103(c).

5. Claims 1-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bawendi et al (WO 0017655) in view of Kohn et al (WO 99/24490).

Bawendi et al disclose a method for preparing a population of water-dispersible (See page 5, lines 31-32) semiconductor nanocrystals, which are quantum dot particles (See page 2, lines 3-4; page 12, lines 15-16; page 18, lines 1-3). Bawendi et al teach that the method comprises coating the hydrophobic semiconductor nanocrystals with an outer layer that stabilizes the semiconductor nanocrystal in aqueous solution (See page 20, lines 8-11). The outer layer

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includes **any** molecule having at least one hydrophobic linking moiety that attaches to the surface of the particle and that terminates in at least one hydrophilic moiety (amphipathic dispersant) (See page 20, lines 11-28) that can be crosslinked to or polymerized with its neighboring molecules to provide stability to the layer by creating an effectively multidentate ligand across the semiconductor surface as illustrated schematically in FIG. 3 (See page 23, lines 23-28). Exemplary hydrophilic groups, that provide the necessary hydrophilic interactions with water to provide stable solutions or suspensions of the semiconductor nanocrystal, include carboxylic acid groups (See page 21, lines 29-32; page 22, lines 1-10; page 24, lines 24-30; pages 25-26). The outer layer may be coated by adding a nonaqueous solvent to a heated mixture of hydrophobic semiconductor nanocrystals with e.g. 30- fold molar excess of the amphipathic molecule having carboxylic acid functional groups (ionizable groups) to form a solution, i.e. admixing hydrophobic semiconductor nanocrystals with e.g. 30- fold molar excess of the amphipathic molecule thereby forming coated semiconductor nanocrystals in the nonaqueous solvent such as THF (See page 33, lines 26-31), rendering the coated semiconductor nanocrystals water-soluble by deprotonation of the carboxylic acid functional groups of the amphipathic molecule by adding a suspension of potassium t-butoxide ionizing agent) in THF to the amphipathic molecule-semiconductor nanocrystal/THF solution (See page 33, lines 3-7), removing the solvent, drying and transferring the coated deprotonated semiconductor nanocrystals to water (See page 34, lines 9-10). Non-limiting examples of **surfactants** include sodium dioctyl sulfosuccinate,  $C_{12}H_{25}(OC_2H_2C_2H_2)_{23}OH$ , even common hand soap, e.g. IVORY soap (essentially a sodium salt of fatty acids), has been successfully used in the preparation of water-soluble nanocrystals (See page 27, lines 29-32; page 28, lines 1-2). The polymer contains pendent carboxylic acid groups permitting substitution of monomer repeating units with hydrophilic or hydrophobic moieties to attenuate the hydrophilic/hydrophobic character of the polymer (See page 26, lines 29-32; page 27, lines 1-7).

Bawendi et al fail to teach that a polymer having **two or more** alternating hydrophobic and hydrophilic regions can be used for the micelle encapsulation (Claim 1).

Kohn et al teach that a polyether surfactant comprising strictly alternating poly(alkylene oxide) and aromatic diol monomeric repeating units (See column 2, lines 22-27) so that *hydrophilic and hydrophobic regions are distributed uniformly* along the polymer chain (See

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column 4, lines 60-63) form self-assembled **micelles** having hydrophobic interiors into which hydrophobic drug particles are incorporated and hydrophilic exteriors which maintain a stable dispersion in aqueous media (See column 1, lines 32-35; column 2, lines 13-21) when mixed with *hydrophobic* drug particles in water (See column 4, lines 55-65; column 9, lines 60-63) thereby forming stable aqueous polymeric **surfactant** dispersions (See column 10, lines 65-67; column 14, lines 1-3). In other words, Kohn et al teach that a polymer having hydrophilic and hydrophobic regions uniformly distributed along the polymer chain is suitable for the use as surfactant for forming self-assembled **micelles** having hydrophobic interiors into which hydrophobic drug particles are incorporated and hydrophilic exteriors which maintain a stable dispersion in aqueous media thereby forming stable aqueous polymeric surfactant dispersions of hydrophobic particles. It is held that the selection of a known material based on its **suitability for its intended use** supported a *prima facie obviousness determination* in Sinclair & Carroll Co. v. Interchemical Corp., 325 U.S. 327, 65 USPQ 297 (1945).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used a polymer having hydrophilic and hydrophobic regions uniformly distributed along the polymer chain as in Bawendi et al with the expectation of forming *micelle* via interaction of a terminal hydrophobic region of the polymer with hydrophobic tail 48 of the inner layer 40 thereby providing stable aqueous polymeric surfactant dispersions of hydrophobic nanoparticles since Kohn et al teach that a polymer having hydrophilic and hydrophobic regions uniformly distributed along the polymer chain is suitable for the use as surfactant for forming self-assembled **micelles** having hydrophobic interiors into which hydrophobic drug particles are incorporated and hydrophilic exteriors which maintain a stable dispersion in aqueous media thereby forming stable aqueous polymeric surfactant dispersions of hydrophobic particles.

6. Claims 1-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bawendi et al (WO 0017655) in view of Ma et al (US 5,221,334).

Bawendi et al are applied here for the same reasons as above. Bawendi et al teach that the outer layer can be made up of (**any**) molecule having at least one hydrophobic linking moiety that attaches to the surface of the particle and that terminates in at least one hydrophilic moiety (See column 13, lines 5-17). The outer layer may be comprised of a **block copolymer of AB block structure** (See column 6, lines 26-40), wherein a first *hydrophobic block* of 3-100

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*monomer units* (See column 6, lines 56-57) is provided that includes a pendant group capable of functioning as a linking moiety, Y, and a *second hydrophilic block of 3-100 monomer units* (See column 6, lines 57-62), which serves as a hydrophilic region, includes at least one pendant group capable of functioning as a hydrophilic group, X (See column 6, lines 26-40). The outer layer can be a mixture of two or more different water-solubilizing molecules, or can comprise additional molecules selected to provide a desirable attribute to the semiconductor nanocrystal (See column 13, lines 17-28).

Bawendi et al fail to teach that the copolymer may have **two or more** alternating hydrophobic and hydrophilic regions (Claim 1).

Ma et al teach that copolymers having hydrophobic and hydrophilic regions where a hydrophobic unit serves to link with a hydrophobic pigment, and the hydrophilic region serves to disperse the pigment in the aqueous medium (See column 3, lines 26-34) is suitable for stabilizing a hydrophobic pigment of 0.005-1microns (5 nm-1000 nm) (See column 7, lines 25-27) in an aqueous medium over long periods (See column 3, lines 15-17). The block copolymers may be either of AB block structure such as **15 EHMA (15 hydrophilic monomer units)//5 MAA (5 hydrophilic monomer units)** (See column 5, lines 33-34) or of ABAB structure with alternating hydrophobic and hydrophilic regions such as **5 BMA(5 hydrophobic monomer units)//10 MAA(10 hydrophilic monomer units)//10 BMA(10 hydrophobic monomer units)/10 MAA(10 hydrophilic monomer units)** (See column 5, lines 62-63).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used copolymers of ABAB structure with alternating hydrophobic and hydrophilic regions where a hydrophobic unit serves to link with a hydrophobic nanoparticle as a dispersant in Bawendi et al instead of copolymer of AB block structure with the expectation of providing the desired stability of aqueous dispersion of nanoparticles since Bawendi et al teach that an outer layer includes any molecule having at least one hydrophobic linking moiety that attaches to the surface of the particle and that terminates in at least one hydrophilic moiety and Ma et al teach that either a copolymer of AB block structure or a copolymer of ABAB structure may be used as dispersant by linking to a hydrophobic particle via a hydrophobic region.

As to claims 2 and 4, Ma et al teach that hydrophilic regions contain ionizable groups such as *acidic* groups (See column 6, lines 12-13). To solubilize the B block into the aqueous

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medium, it may be necessary to make salts of either the acid or amino groups contained in the B block. Salts of the acid monomers can be made with the counter component being selected from nitrogenous bases and sodium and potassium hydroxides. Amphoteric polymers, that is polymer that contains both an acid group and an amino group, may be used as is or can be neutralized with either addition of acid or base. See column 6, lines 12-39.

As to claim 8, Bawendi et al in view of Ma et al fail to teach that the number ratio of the amphipathic dispersant to the plurality of nanoparticles in step (a) is in the range of approximately 50:1 to approximately 5000:1.

Although Bawendi et al teach a 30-fold excess of the amphipathic molecule in example 2, one of ordinary skill in the art at would know that the amount of the amphipathic molecule would depend on particular amphipathic molecule used.

It is held that concentration limitations are obvious absent a showing of criticality. *Akzo v. E.I. du Pont de Nemours* 1 USPQ 2d 1704 (Fed. Cir. 1987).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have determined the optimum values of the relevant concentration parameters (including those of claim 8) in Bawendi et al in view of Ma et al through routine experimentation in the absence of a showing of criticality.

As to claim 9, Bawendi et al teach that crosslinking neighboring molecules in the coating outer layer provides stability to the layer by creating an effectively multidentate ligand across the semiconductor surface as illustrated schematically in FIG. 3 (See page 23, lines 23-28).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have crosslinked neighboring molecules in Bawendi et al in view of Ma et al the coating outer layer with the expectation of providing the desired stability to the layer by creating an effectively multidentate ligand across the semiconductor surface, as taught by Bawendi et al.

As to claims 11-12, Ma et al teach that the dispersant is a copolymer of a hydrophilic monomer selected from the group consisting of acrylic acid, methacrylic acid and combinations thereof (See column 4, lines 40-43), with at least one hydrophobic alkyl (C1-C9) acrylamide monomer (See column 3, lines 35-43).

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As to claims 13-16, Ma et al teach that block copolymers have a number average molecular weight below 20,000, preferably below 15,000, and typically in the range of 1,000 to 3,000 (See column 5, lines 1-6).

### ***Response to Arguments***

7. Applicant's arguments with respect to claims 1-16 have been considered but are moot in view of the new ground(s) of rejection.

### ***Conclusion***

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Elena Tsoy whose telephone number is 571-272-1429. The examiner can normally be reached on Monday-Thursday, 9:00AM - 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks can be reached on 571-272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications

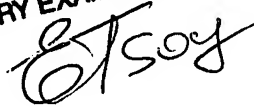


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may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Elena Tsoy  
Primary Examiner  
Art Unit 1762

ELENA TSOY  
PRIMARY EXAMINER

A handwritten signature in black ink, appearing to read 'ETsoy', is written over the printed name and title.

January 9, 2007